DOI: 10.7860/JCDR/2017/22168.9422

Effect of Pneumoperitoneum and Lateral Position on Oropharyngeal Seal Pressures of Proseal LMA in Laparoscopic Urological Procedures

PREETI RUSTAGI[1], GEETA A. PATKAR[2], ANIL KUMAR OURASANG[3], BHARATI A. TENDOLKAR[4]

ABSTRACT

Introduction: A sustained and effective oropharyngeal sealing with supraglottic airway is required to maintain the ventilation during laparoscopic surgery. Previous studies have observed the Oropharyngeal Seal Pressure (OSP) for Proseal Laryngeal Mask Airway (PLMA) after pneumoperitoneum in supine and trendelenburg position, where PLMA was found to be an effective airway device. This study was conducted with ProSeal LMA, for laparoscopic Urologic procedures done in lateral position.

Aim: To measure OSP in supine and lateral position and to observe the effect of pneumoperitoneum in lateral position on OSP. Secondary objectives were to assess adequacy of ventilation and incidence of adverse events.

Materials and Methods: A total number of 25 patients of American Society of Anaesthesiologists (ASA) physical status II and I were enrolled. After induction of anaesthesia using a standardized protocol, PLMA was inserted. Ryle's tube was inserted through drain tube. The position of PLMA was confirmed with ease of insertion of Ryle's tube and fibreoptic grading of vocal cords. Patients were then put in lateral position. The OSP was measured in supine position. This value was baseline comparison for OSP in lateral position and that after pneumoperitoneum. We assessed the efficacy of PLMA for ventilation, after carboperitoneum in lateral position (peak airway pressure, End Tidal Carbon dioxide ($EtCO_2$), SPO_2). Incidence of adverse effects (displacement of device, gastric insufflation, regurgitation, coughing, sore throat, blood on device, trauma) was also noted.

Results: The OSP was above Peak Airway Pressure (PAP) in supine (22.1±5.4 and 15.4±4.49cm of H_2O) and lateral position (22.6±5.3 and 16.1±4.6).

After pneumoperitoneum, which was in lateral position, there was statistically significant (p-value <0.05) increase in both PAP (19.96±4.015) and OSP (24.32±4.98, p-value 0.03).

There was no intraoperative displacement of PLMA. There was no event of suboptimal oxygenation. $EtCO_2$ was always within normal limits. Gastric insufflation was present in one patient. One patient had coughing and blood was detected on device. Three patients had throat discomfort post-operatively.

Conclusion: In this study, Oropharyngeal seal pressures with PLMA were found to increase after pneumoperitoneum in lateral position. PLMA forms an effective seal around airway and is an efficient and safe alternative for airway management in urological laparoscopic surgeries done in lateral position.

Keywords: Airway, Lateral position, Proseal laryngeal mask

INTRODUCTION

Laparoscopic surgery, an evolving subspecialty has now extended to advanced urologic procedures, which often require lateral position.

Although the tracheal tube is considered gold standard for laparoscopic procedures, many investigators have evaluated the efficacy and safety of supraglottic devices for such procedures. A sustained and effective oropharyngeal sealing with Supraglottic Airway (SGA) is required to maintain the ventilation during laparoscopy.

The Proseal Laryngeal Mask Airway (PLMA) was designed to improve oropharyngeal leak pressures and protect from aspiration via the built-in gastric drain tube [1,2].

Many studies, which have compared PLMA with endotracheal tube and with the Classic Laryngeal Mask Airway (CLMA), have highlighted the safety of PLMA in laparoscopic surgeries [3-9] and considered it as an alternative device for airway management in such procedures.

Further studies have evaluated the influence of head and neck position (neutral, flexion, extension, lateral rotation) on Oropharyngeal Seal Pressure (OSP) of various supraglottic airways [10,11]. However, in all these studies OSP is measured in supine position.

Effect of trendelenburg position along with pneumoperitoneum on the oropharyngeal seal pressures of PLMA has been studied by few and they found PLMA to be a safe device [12,13].

In this study, the safety and efficacy of PLMA for laparoscopic procedures in lateral position, was assessed. The primary outcome measure was the OSP in both supine and lateral position and after pneumoperitoneum in lateral position. Secondary outcomes were adequacy of ventilation and the incidence of adverse events.

MATERIALS AND METHODS

After approval from Department Review Board and institutional Ethics committee, this prospective observational study was conducted over a period of two years (2013-2015). After thorough preoperative evaluation and written informed consent, 25 patients aged 18-65years of ASA physical status II and I, scheduled for elective laparoscopic procedures done in lateral position, were included in study. Patients with ASA class III or higher, Body Mass Index (BMI) ≥ 30, mouth opening less than 2.0 cm and patients at risk of aspiration-hiatus hernia, Gastro-oesophageal reflux disease, pregnant female were excluded from study.

PLMA was chosen in accordance with the manufacturers' recommendations, based on a patient's weight (i.e., Size 3, 30-50kg; Size 4, 50-70kg; and Size 5, >70kg) [2]. Anaesthesiologist having at least one year of experience of using the device, inserted the device.

General anaesthesia was given as per standard protocol. After premedication with Inj. Glycopyrolate-0.004 mg/kg and Inj. Midazolam-0.05mg/kg intravenously, anaesthesia was induced with inj. fentanyl 2ug/kg and Inj-Propofol - 2 to 2.5mg/kg till loss of consciousness. Neuromuscular blockade was achieved with Inj- Vecuronium bromide 0.1mg/kg. Patients were ventilated with 50% nitrous oxide in oxygen for three minutes. The PLMA was inserted after lubricating the cuff with water-based jelly. The device was inserted using the introducer tool as recommended by the manufacturer [2]. Cuff was inflated with air so as to maintain the cuff pressure of 60cm of H_2O (cuff pressure monitor: Mallinckrodt Medical, Athlone, Ireland). Then the device was fixed, secured and connected to breathing circuit. The patient's lungs were ventilated via a circle-CO_2 – absorber-breathing system (Penlon Prima SP_2, AV 900 ventilator, Abingdon, UK).

Ryle's tube was passed through the drain tube and its correct placement was confirmed by epigastric auscultation.

Correct placement of the device in supine position was confirmed by: 1) Manual ventilation; 2) Expired tidal volume of >8ml/kg; 3) Square wave capnography; 4) Proper placement of Ryle's tube; 5) Fibreoptic confirmation of glottic view. The images of the larynx were scored as per Brimacombe score: Score 4, only the vocal cords were visible; Score 3, the vocal cords plus the posterior epiglottis were visible; Score 2, the vocal cords plus the anterior epiglottis were visible; and Score 1, the vocal cords were not visible [14].

Patients were then put in lateral position. Anaesthesia was maintained with 0_2 + N_2O + Propofol infusion + intermittent Vecuronium on closed circuit with a tidal volume of 8-10ml/kg. The aim was to maintain SpO_2 of 99-100% and $EtCO_2$ of 30-40mm of Hg and Peak Airway Pressure (PAP) less than 35 cm of H_2O.

Any displacement of the device in lateral position was assessed clinically by: 1) inability to maintain adequate ventilation and absence of square wave capnography; 2) any new audible leak which was not there in supine position; 3) SpO_2 less than 95%- $EtCO_2$ more than 45mm of Hg in spite of positive pressure ventilation.

OSP was recorded in the supine, lateral position and after carboperitoneum. This was determined by closing the expiratory valve of the circle system at a fixed gas flow of 3L/min. The pressure manometer was observed at point of equilibrium- this was the oropharyngeal seal pressure.

PAP were recorded during volume controlled ventilation with PLMA from the in-built pressure gauge of the anaesthesia machine (Penlon) in supine position and in lateral position before and after carboperitoneum, and at every 15min intervals for first hour and then at 30min interval till the end of surgery.

$EtCO_2$ and SpO_2 were monitored throughout the procedure. When SpO_2 was 94-90% the oxygenation was graded as suboptimal and failed if it was <90%.

The preset abdominal insufflation pressure was kept between 12-14mmHg for all procedures and Surgeons were asked to comment on presence of gastric insufflation if any.

After the completion of surgery, the propofol infusion was discontinued, and the residual neuromuscular block was reversed by IV neostigmine (0.06mg/kg) and glycopyrrolate (10µg/kg). Once the patient was awake, breathing spontaneously, and responding to verbal commands, PLMA was removed. The presence of blood after the removal of the PLMA and the presence of any cough, regurgitation were recorded. Any injury to lips, teeth or tongue was noted during insertion and removal of the device. Evidence of sore throat post-operatively was assessed using 3-point scale: 0 – No complaints at all; 1–Throat discomfort; 2 - Continuous throat pain.

Haemodynamic parameters (Heart Rate, Mean arterial pressure) were measured throughout the surgery and post-operatively also.

STATISTICAL ANALYSIS

Statistical tests were performed using Statistical Package For Social Sciences (SPSS) software, (10.0 version; SPSS Inc., Chicago, IL, USA) and results are reported as absolute, percentage, range or median (interquartile range). Students paired T-test applied for parametric data. Significance was taken as $p < 0.05$.

RESULTS

Patient characteristics and surgical parameters are described in [Table/Fig-1]. Mean age of our patients was 37.24±15.81years and mean weight was 60.2±12.4kg.

Patients undergoing laparoscopic urological surgeries including nephrectomy, pyeloplasty and ureterolithotomy were studied. Mean duration of surgery was 136.3±26.2minutes.

Mean duration of anaesthesia and peritoneal insufflation was 156.6±27.1minutes and 94.1±30.6minutes respectively.

Most patients accepted PLMA size 3 and 4 except one patient who accepted size 5. Gastric tube could be passed through drain tube easily in first attempt in all patients. The fibreoptic view of glottis through PLMA was conducted in all patients in supine position [Table/Fig-2].

[Table/Fig-3] shows the ventilation and oxygenation profiles which were recorded pre-induction, after PLMA insertion, 15minutes after carboperitoneum and at the end of surgery.

The OSP in supine position was 22.16±5.41cm of H_2O; this was well above the peak airway pressures (15.4±4.49cm of H_2O) in that position [Table/Fig-3].

On giving lateral position there was very slight increase in both Oropharyngeal seal pressure (22.64±5.367) and Peak airway pressure (16.12±4.68), but it was not statistically significant as compared to that in supine position (p-value 0.417 and 0.089 respectively). OSP was well above PAP.

There was statistically significant (p-value < 0.05) increase in PAP (19.96±4.015) after pneumoperitoneum, which was in lateral position. At the same time there was statistically significant (p-value 0.03) increase in the OSP (24.32±4.98).

The mean OSP was always above mean PAP till the end of surgery. (22.5±5 and 18.2±2.5 respectively).

The complications in this study were of minor nature [Table/Fig-4]. There was no intraoperative displacement of device. Gastric insufflation was present in one patient, as commented by surgeons but it was not hindering with surgery and did not demand reposition or change of PLMA. One patient had coughing at the time of removal of the device. Same patient also had blood on PLMA.

Three patients had sore throat, which was graded as 1 (throat discomfort).

Optimal oxygenation was noted in all patients. None of the patients had any episode of suboptimal oxygenation (SpO_2<95%) after giving lateral position or after insufflation of CO_2.

There was statistically significant (p-value 0.005) increase in the $ETCO_2$ after pneumoperitoneum, which is expected for all laparoscopic surgeries. The increase in $EtCO_2$ was managed by increasing minute volume (increasing respiratory rate and tidal volume). Values were maintained within normal limits through out the surgery.

DISCUSSION

In this study, oropharyngeal seal pressures were measured and adequacy of ventilation for PLMA in 25 patients undergoing elective laparoscopic urological surgery in lateral position was assessed. Earlier studies have reported PLMA to be an effective airway device for laparoscopic surgeries [3-9].

Age (yrs)	37.24±15.81
Sex M/F: NO. (%)	13(52)/12(48)
ASA I/II: NO. (%)	15(60)/10(40)
Weight (kg)	60.2±12.4
MPC I/II/: NO. (%)	10(40)/15(60)
Type of surgery Nephrectomy/pyeloplasty/ureterolithotomy No.(%)	14(56)/9(36)/2(8)
Duration of anaesthesia (min)	155.6±27.1
Duration of surgery (min)	136.3±26.2
Duration of insufflation (min)	94.1±30.6

[Table/Fig-1]: Demographic data and timing.

Size of PLMA inserted 3/4 /5 :no. (%)	11(44)/14(56)/1(4)
Attempts at gastric tube insertion 1/2/3: no.(%)	25(100)/0(0)/0(0)
Fibreoptic grading of cords 4/3/2/1 :no.(%)	21(84)/4(16)/ 0(0)/0(0)

[Table/Fig-2]: PLMA parameters.

Parameter	Pre induction	After PLMA insertion	After lateral position	After 15 min of carbo-peritoneum	End of surgery
OSP (cm of H_2O)	-	22.1±5.4	22.6±5.3 (p=0.41)	24.32±4.9 (p =0.03)	22.5±5.0 (0.34)
PAP (cm of H_2O)	-	15.4±4.4	16.1±4.6 (p=0.08)	19.9±4.1 (p=0.00)	18.2±2.5 (p=0.008)
$ETCO_2$ (mmHg)	31.1±2.09	32.3±4.7 (p= 0.20)	31.3±3.1 p= 0.35	34.1±4.5 (p=0.005)	31.5±3.8 p= 0.65
SPO_2 (%)	99.0±0.9	99.3±0.4	99.3±0.5	99.4±0.5	99.2±0.5

[Table/Fig-3]: Ventilation parameters.
(OSP: Orophayngeal Seal Pressure; PAP: Peak Airway Pressure: values expressed as means±SD: OSP were well above PAP throughout the procedure; student paired t-test was used to compare the baseline parameters recorded in supine position with those recorded subsequently: Significance taken as p < 0.05).

Event	No.	%
Intraoperative		
Displacement of device	0	0.00
Aspiration	0	0.00
Gastric insufflation	1	4
Injury to lips /gums /tongue	0	0.00
At removal		
Coughing	1	4
vomiting	0	0.00
Regurgitation	0	0.00
Trauma to lip /gum/tongue		
Blood on device	1	4
Postoperative		
Sore throat	3	12
Dysphagia	0	0.00
Dysphonia	0	0.00
Dysarthria	0	0.00

[Table/Fig-4]: Adverse events.

Correct placement of PLMA in supine position was confirmed by ease of insertion of Ryle's tube and by fibreoptic grading of the vocal cords. In 84% of patients fibreoptic view could be graded as 4, the rest were of grade 3 and none of the patients had a laryngeal view, which was not compatible with ventilation. This was in accordance with the other studies [15]. Sharma et al., studied efficacy and safety of PLMA for laparoscopic cholecystectomy in 1000 cases and fibreoptic view of glottis was graded as 4 in 85.3% of patients [16].

Assessment of the position via fibreoptic bronchoscope through the drain tube was not done, as the gastric tube was passed easily in 1st attempt in all patients and this re-confirmed proper placement of the PLMA. Agro et al., correlated the, ease of Ryle's tube insertion through the drain tube with positioning of the airway over the larynx, assessed fibre optically and concluded that easy Ryle's tube passage indicates correct positioning; difficulty in passing a Ryle's tube suggests that the mask should be repositioned even if ventilation is satisfactory [17]. Brain AJ et al., in their study found that at 60cm H_2O intra cuff pressure, the PLMA gave twice the seal pressure of the standard device (LMA Classic) (p<0.0001) and permitted blind insertion of a gastric tube in all cases [18].

To ventilate safely with a laryngeal mask, it is important to use a mask with a high seal pressure and positive pressure ventilation with a lower peak inspiratory pressure [19].

Several design factors contribute to the improved airway seal of the PLMA. The dorsal cuff of PLMA pushes the mask anterior to provide a better seal around the glottis and permits high airway pressures without leak. The drain tube serves as a passage for gastric tube and allows passively regurgitated gastric fluid to drain away from the airway [20].

The oropharyngeal seal pressures were measured in various positions. In the supine position it was 22.16±5.41cm of H_2O, this was well above the peak airway pressures (15.4±4.49 cm of H_2O) in that position.

Lu et al., in their study (laparoscopic cholecystectomy) measured OSP in CLMA and PLMA and results were 19±4cm and 29±6cm of H_2O respectively which was above the peak airway pressure they measured before and after carboperitoneum. (17±3 and 22±3cm of H_2O for CLMA and 18±3 and 24±4cm of H_2O for PLMA). OSP was significantly high in PLMA group. They concluded that PLMA is a more effective device for ventilation in laparoscopic cholecystectomy than the CLMA [4].

Sharma et al. found mean OSP to be 36cm H_2O with PLMA use in laparoscopic cholecystectomy and concluded that PLMA forms an effective seal around the glottis [16].

Few researchers have studied the stability of PLMA in different head and neck position [10,11]. Brimacombe JR et al., observed that airway seal pressure increased approximately 25% with neck flexion and rotation, and decreased 25% with neck extension [10]. The authors attributed this to differences in pharyngeal volume in these positions He also concluded drain tube position did not alter with movement of head and neck. Taxak et al., reported similar changes in OSP with change of head position [11].

In this study, patients were given complete lateral position with head and body aligned. There was no displacement of device after positioning, as confirmed by clinical parameters. Study by Sharma B et al., had also different surgical positions for various surgeries including nephrectomy, ureterolithotomy and pyeloplasty. There was no intraoperative displacement of device [16].

On giving lateral position there was slight increase in both OSP (22.6±5.3cm of H_2O, p-value 0.417) and PAP (16.1±4.6cm of H_2O, p-value 0.089), when compared to those in supine position. The changes were not statistically significant.

There was statistically significant (p-value < 0.05) increase PAP after pneumoperitoneum (19.9±4.0cm of H_2O) as expected in laparoscopic surgeries but it was always below OSP. Because of pneumoperitoneum, the pulmonary compliance is reduced, and the resistance increased, leading to higher airway pressures [21,22].

After pneumoperitoneum, which was done in lateral position there was statistically significant (p-value 0.03) increase in the OSP (24.32±4.9cm of H_2O), which was to our advantage.

Kim YH et al., studied OSP of PLMA in laparoscopic cholecystectomy (Ante–Trendeleneburg position) and laparoscopic gynaecological surgeries (Trendeleneburg - lithotomy position) and reported that increase in intra- abdominal pressure by pneumo-peritoneum and changes in position during laparoscopic surgery had no effect on OSP of PLMA [12].

Mishra et al., who evaluated the effect of pneumoperitoneum and the trendelenberg position on OSP in laparoscopic gynaecological surgery, observed a significant increase in OSP after the creation of carboperitoneum compared with their baseline values. They attributed it to the upward movement of the trachea because of the increase in intra-abdominal pressure in an already placed and fixed LMA [13].

SpO_2 and $EtCO_2$ values were compared from the base line values. The SpO_2 values did not change significantly [Table/Fig-3]. There were no events of hypoxia or suboptimal oxygenation. There was a significant rise in the $EtCO_2$ values after pneumopertioneum as compared to pre-induction values. However, the $EtCO_2$ values remained within clinical normal limits throughout the surgery. This rise in $EtCO_2$ was managed by marginally increasing the minute ventilation.

Maltby et al., in their study, to compare PLMA with Endotracheal Tube (ETT) during laparoscopic cholecystectomy, found no statistically significant differences in SpO_2 or $EtCO_2$ between the two groups. They concluded that a correctly seated PLMA or ETT provided equally effective pulmonary ventilation without clinically significant gastric distension in all non-obese patients [3].

Saraswat et al., in a similar comparison reported suboptimal oxygenation ($SpO_2 < 94\%$) after reverse Trendeleneburg position in one patient with PLMA use. The oxygen saturation returned to normal after the PLMA was repositioned [23]. In our study ventilation was adequate in all patients and no repositioning or change of device was required.

The haemodynamic parameters were noted from preoperative levels throughout the intraoperative period till the removal of device. The pulse rate and mean arterial pressure were within normal limits though out.

One important feature of PLMA is to prevent gastric insufflation due to the better oropharyngeal seal pressures. In this study, one patient had gastric insufflation, but it was not hindering surgery and surgeons were comfortable. The reported incidence of gastric insufflation is 0.1 percent [24]. In our study it was higher (4%)

There are three reported cases of pulmonary aspiration following PLMA use in laparoscopic surgery [25-27]. There was no case of pulmonary aspiration in this study. To reduce the risk of aspiration with PLMA, careful selection of patients and surgical procedure, proper placement of device along with optimal management during maintenance and emergence phases is necessary [28].

One patient had coughing while removal and blood was detected on the device. No patients had injury to lips, gums, teeth. Three patients had sore throat, which was of grade 1 which could be attributed to more number of insertion attempts required in those patients. High intra-cuff pressure in LMAs impedes pharyngeal mucosal perfusion, and this factor may lead to pharyngolaryngeal complications. The cuff pressure in this study was maintained at 60cm H_2O. Therefore, there were fewer complications. Seet et al., observed similar results while measuring the LMA cuff pressure and pharyngolaryngeal complications in patients with manometers to limit the LMA intracuff pressure (i.e., 60cmH_2O) [29].

LIMITATION

The position of PLMA in lateral position was not confirmed through fibreoptic bronchoscope, it was based on clinical parameters. To the best of our knowledge there are no studies for the use of proseal LMA in laparoscopic procedures in lateral position. This study was designed as a preliminary feasibility study. Hence a sample size of 25 patients was chosen, which was in accordance with other feasibility studies [30,31].

CONCLUSION

In this study PLMA was found to form an effective seal around airway and is an efficient and safe alternative for airway management in urological laparoscopic surgeries done in lateral position.

REFERENCES

[1] Cook TM, Howes B. Supraglottic airway devices: Recent advances. Contin Educ Anaesth Crit Care Pain. 2011;2:56-61.

[2] LMA ProSeal 40-use guide. Available from: http://www.teleflex.com/emea/documentLibrary/documents/940769-000001_LMA-ProSeal-40useguide_1408_PDF.

[3] Maltby JR, Beriault MT, Watson NC, Liepert D, Fick GH. The LMA-ProSeal is an effective alternative to tracheal intubation for laparoscopic cholecystectomy. Can J Anaesth. 2002;49:857-62.

[4] Lu PP, Brimacombe J, Yang C, Shyr M. ProSeal versus the classic laryngeal mask airway for positive pressure ventilation during laparoscopic cholecystectomy. Br J Anaesth. 2002;88:824-27.

[5] Maltby JR, Beriault MT, Watson NC, Liepert DJ, Fick GH. LMA-Classic and LMA-ProSeal are effective alternatives to endotracheal intubation for gynaecologic laparoscopy. Can J Anaesth. 2003;50:71-77.

[6] Natalini G, Lanza G, Rosano A, Dell'Agnolo P, Bernardini A. Standard laryngeal mask airway and LMA-ProSeal during laparoscopic surgery. J Clin Anaesth. 2003;15:428-32.

[7] Roth H, Genzwuerker HV, Rothhaas A, Finteis T, Schmeck J. The ProSeal laryngeal mask airway and the laryngeal tube Suction for ventilation in gynaecological patients undergoing laparoscopic surgery. Eur J Anaesthesiol. 2005;22:117-22.

[8] Piper SN, Triem JG, Rohm KD, Maleck WH, Schollhorn TA, Boldt J. ProSeal-laryngeal mask versus endotracheal intubation in patients undergoing gynaecologic laparoscopy. Anasthesiol Intensivmed Notfallmed Schmerzther. 2004; 39:132-37.

[9] Sinha A, Sharma B. Sood J. ProSeal™ as an alternative to endotracheal intubation in paediatric laparoscopy. Paediatr Anaesth. 2007;17:327-32.

[10] Brimacombe J, Keller C. Stability of the LMA-Proseal and standard laryngeal mask airway in different head and neck positions: arandomized crossover study. European Journal of Anaesthesiology. 2003;20(1):65–69.

[11] Taxak S, Rani S, Ahlawat G, Singh K. A study to compare the stability of proseal laryngeal mask airway and standard laryngeal mask airway in different head and neck positions. International Journal of Pharmacology and Clinical Sciences. 2015;4(1):01-06.

[12] Kim YH, Mun SH, Kim HS, Kim JH, Yi YJ. Changes in position and intra-abdominal pressure do not influence oropharyngeal leak pressure in laparoscopic surgery maintained with a proseal laryngeal mask airway. Korean J Anaesthesiol. 2005; 49(1):47-52.

[13] Mishra SK, Sivaraman B, Balachander H, Naggappa M, Parida S, Bhat RR, et al. Effect of pneumoperitoneum and trendelenberg position on oropharyngeal sealing pressure of I-gel and proseal LMA in laparoscopic gynaecological surgery: a randomized controlled trial. Anaesth Essays Res. 2015;9:353-58 .

[14] Brimacombe J, Berry A. A proposed fiber-optic scoring system to stan- dardize the assessment of laryngeal mask airway position. Anaesth Analg. 1993; 76:457.

[15] Cook TM, Lee G, Nolan JP. The proseal laryngeal mask airway: A review of literature. Can J Anaesth. 2005;52:739-60.

[16] Sharma B, Sood J, Sahai C, Kumra VP. Efficacy and safety performance of proseal laryngeal mask airway in laparoscopic surgery: Experience of 1000 Cases. Indian J Anaesth. 2008;52:288-96.

[17] Agro F, Antonelli S, Cataldo R, Mentecchia F, Barzoi G, Pettiti T. The proseal laryngeal mask airway: Fibreoptic vizualisation of the glottic opening is associated with ease of insertion of the gastric tube. Can J Anaesth. 2002;49:867–70.

[18] Brain AIJ, Verghese C, Strube PJ. The LMA 'proseal'–a laryngeal mask with an ooesophageal vent. Br J Anaesth. 2000;84:650-54.

[19] Nandi PR, Nunn JF, Charlesworth CH, Taylor SJ. Radiological study of the Laryngeal Mask. European Journal of Anaesthesiology. 1991;8(4):33–39.

[20] Misra MN, Ramamurthy B. The Pro-Seal LMAtm and the tracheal tube: A comparison of events at insertion of the airway device. Internet J Anaesthesiol. 2008;16.

[21] Sharma B, Sehgal R, Sahai C, Sood J. PLMA vs. I-gel: A comparative evaluation of respiratory mechanics in laparoscopic cholecystectomy. J Anaesthesiol Clin Pharmacol. 2010;26:451–57.

[22] Jeon WJ, Cho SY, Baek SJ, Kim KH. Comparison of the proseal LMA and intersurgical I-gel during gynaecological laparoscopy. Korean J Anaesthesiol. 2012;63:510–14.

[23] Saraswat N, Kumar A, Mishra A, Gupta A, Saurabh G, Srivastava U. The comparison of proseal laryngeal mask airway and endotracheal tube in patients undergoing laparoscopic surgeries under general anaesthesia. Indian J Anaesth. 2011;55:129-34.

[24] Brimacombe J. Laryngeal mask anaesthesia. Principle and practice, 2nd ed. London: WB Saunders, 2005.

[25] Brimacombe J, Keller C. Aspiration of gastric contents during use of a proseal™ laryngeal mask airway secondary to unidentified fold over malposition. Anaesth Analg. 2003;97:1192-94.

[26] Putzke C, Max M, Wulf H. Severe ARDS following perioperative aspiration of gastric content with the use of a “ProSeal” laryngeal mask airway. Anasthesiol Intensivmed Not fall med Schmerzther. 2005;40:487-89.
[27] Koay CK. A case of aspiration with the proseal LMA (Letter). Anaesth Intensive Care. 2003;31:123.
[28] Keller C, Brimacombe J, Bittersohl J, Lirk P, Goedecke AV. Aspiration and the laryngeal mask airway: Three cases and a review of the literature. Br J Anaesth. 2004;93:579-82.
[29] Seet E, Rajeev S, Firoz T, Yousaf F, Wong J, Wong DT, et al. Safety and efficacy of laryngeal mask airway supreme versus laryngeal mask airway proseal: a randomized controlled trial. Eur J Anaesthesiol. 2010;27:602e7.
[30] Mehta N, Dar MR, Sharma S. Thoracic combined spinal epidural anaesthesia for laparoscopic cholecystectomy: A feasibility study. J Anaesthesiol Clin Pharmacol. 2016;32(2):224-28.
[31] Van Zundert AA, Stultiens G, Jakimowicz JJ. Laparoscopic cholecystectomy under segmental thoracic spinal anaesthesia: A feasibility study. Br J Anaesth. 2007;98(5):682.

PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Anaesthesiology, Lokmanya Tilak Municipal Medical College and Lokmanya Tilak Municipal General Hospital, Sion, Mumbai, Maharashtra, India.
2. Professor, Department of Anaesthesiology, Lokmanya Tilak Municipal Medical College and Lokmanya Tilak Municipal General Hospital, Sion, Mumbai, Maharashtra, India.
3. Registrar, Department of Anaesthesiology, Lokmanya Tilak Municipal Medical College and Lokmanya Tilak Municipal General Hospital, Sion, Mumbai, Maharashtra, India.
4. Professor and Head, Department of Anaesthesiology, Lokmanya Tilak Municipal Medical College and Lokmanya Tilak Municipal General Hospital, Sion, Mumbai, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Preeti Rustagi,
602, Narayan Niwas CHS, Twinkle Star society, Chembur, Mumbai-40071, Maharashtra, India.
E-mail: drpreetirustagi@rediffmail.com

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Jun 18, 2016**
Date of Peer Review: **Aug 11, 2016**
Date of Acceptance: **Oct 29, 2016**
Date of Publishing: **Feb 01, 2017**